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ABSTRACT

A program schedule and background information for Indiana Commission for Higher Education-sponsored discussion of the use of educational technology to increase educational effeciency are presented. The four major topics of discussion to illustrate the uses and advantages/disadvantages of audio, video, and computing technologies are as follows: degree credit instruction, continuing professional education, computer-based instruction and information services, and community service educational programming. Audio, video, and computing technologies are being used by business, libraries, museums, schools, and other organizations to expand access to current services, add new services, and reduce the costs of providing services. Participation rates of adult learners in Indiana are presented, and examples of current uses of learning technologies in Indiana and elsewhere are described. Data are provided on the location of cable TV companies in Indiana, type of TV market, number of subscribers, and the channel capacity. According to local reports, there is at present only a minimal amount of instructional programming on cable TV, but great potential for more. Public television in general and in Indiana is also considered. The following four articles are also included: "Instructional Television--Higher Education without Commercial Interruption," by Carol Herrnstadt Shulman: "Education's Technological Revolution: An Event in Search of Leaders," by Allan F. Hershfield; "A Teacher Named PLATO: Computer-Assisted Instruction," and "Community Access Channel Three, Monroe County Public Library." (SW)

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ED205136

INCREASING EDUCATIONAL EFFICIENCY THROUGH TECHNOLOGY

(Commission Discussion and Background Materials)

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STATE OF INDIANA

Commission for Higher Education

June 11, 1981

HE 014 181

To Lynn Barnett
ERIC

STATE OF INDIANA
COMMISSION FOR HIGHER EDUCATION
143 WEST MARKET STREET
INDIANAPOLIS, INDIANA 46204
317-232-1900

TO: Individuals Invited to Commission Discussion of Increasing Educational Efficiency Through Technology (June 11, 2:30 - 4:30 p.m.)

FROM: George B. Weathersby GBW

SUBJECT: Schedule of Discussion and Background Materials

Enclosed is the program schedule for the four major topics of discussion scheduled for June 11, 1981 to illustrate the uses and advantages/disadvantages of audio, video, and computing technologies in: (1) degree credit instruction; (2) continuing professional education; (3) computer based instruction and information services; and (4) community service educational programming.

Also enclosed are seven brief sections of background materials which provide summary information and a description for some of the examples to be discussed on June 11:

A. "Increasing Educational Efficiency by Using Technology."

B. "Cable TV."

C. "Public TV."

D. "Instructional television - Higher Education without commercial interruption," by Carol Herrnstadt Shulman, AAHE - ERIC Research Currents, May 1981.

E. "Education's Technological Revolution: An Event in Search of Leaders," by Allan F. Hershfield, Change Magazine, November-December 1980.

F. "A Teacher Named PLATO: Computer-Assisted Instruction," reprinted from Research and Creative Activity at Indiana University, Bloomington, January 1979.

G. "Community Access Channel Three, Monroe County Public Library."

Enclosures

#E 014 181

Commission for Higher Education
Regular Meeting
June 11, 1981

Program Schedule

2:30 - 2:40 p.m. Introductions and overview of meeting by Commission Chairman Donald Holmquist and George Weathersby, Commissioner, in Indianapolis at the University Hospital studio.

The format for each segment to follow will be the same:
2 - 3 minute introduction by local host
4 - 7 minute film clip
15 - 20 minutes of discussion [inviting both on-camera and studio participants]
Dr. Weathersby to conclude each segment and introduce the next topic, site, and host.

2:40 - 3:02 p.m. from West Lafayette: degree credit instruction, illustrated by Purdue University's master's degree program in engineering, with Charles Elliott. John Glade is the local producer.

3:05 - 3:27 p.m. from Indianapolis: continuing professional education, illustrated by the IU Medical School's "Newborn" series with Richard Schreiner. Don Greene is the local producer.

3:30 - 3:52 p.m. from Bloomington: computing technologies for instruction and information services, illustrated by Indiana University's use of PLATO, with William Sanders (PLATO Coordinator), Dan De Hayes (Academic Computing Services), Gary Wittlich (Music), and Will Counts (Journalism). William Kroll and James Perry are the local producers.

3:55 - 4:20 p.m. from Bloomington: community service educational programming, illustrated by the Monroe County Library's use of video technologies, with Don Smith in Bloomington, and the Indianapolis Museum of Art's use of film, with Al Louer in Indianapolis. William Kroll and James Perry are producers in Bloomington; Don Greene is producer in Indianapolis.

4:20 - 4:30 p.m. Concluding remarks by Donald Holmquist and George Weathersby.

Participation Sites

Indianapolis: Room A116 University Hospital TV studio
Indianapolis: IHETS studio
West Lafayette: Room 262 Potter Engineering Building
Bloomington: Studio 6, Radio and TV Building

Discussion Item: A

Increasing Educational Efficiency by Using Technology

Audio, video and computing technologies are being used by business, libraries, museums, schools, colleges and other organizations to accomplish several objectives: (1) to expand access to current services, (2) to add new services, and (3) to reduce the costs of providing services. Some benefits of these technologies for education are as follows:

-- improved access to instruction and information
-- expanded choice and diversity of programming
-- enhanced program quality
-- improved quality control
-- increased productivity
-- improved management of information
-- reduced fixed costs
-- reduced cost/participant

We wish to consider these objectives and benefits by focusing on four areas in which technology is being used to increase educational efficiency:

-- degree credit instruction
-- continuing professional education
-- computer-based instruction and information services
-- community service educational programming

The participation rate in learning activities by adults in Indiana is high. In the Nielsen survey of adult learning in 1978, 20% of the statewide sample of adults reported that they had participated in some type of formal learning activity within the past year, excluding full-time postsecondary students. Only fifty-one percent of this learning was provided by public, private, or proprietary educational institutions; therefore half of all organized adult learning was sponsored by other than traditional educational establishments, such as community organizations, professional organizations, employees, and churches. Further, less than half of all adult learning -- 46% -- was taking place in a school or university setting. (Table I outlines other pertinent data from the Nielsen study.) The potential contributions of audio, video, and computing technologies in improving and expanding the learning opportunities which adult Hoosiers are already taking advantage of is great.

Examples of current uses of learning technologies in Indiana and elsewhere are described below.

Expanding Access to Current Services: Degree Credit Instruction

Probably the best known efforts to offer degree credit instructional programs by television are those of Coastline Community College in California, the Miami-Dade Community College in Florida, the University of Maryland's University College, the University of Mid-America, Wayne State University, and the British Open University and its European counterparts. According to a Wall Street Journal report,

Table I

ADULT LEARNING PARTICIPATION IN INDIANA
August, 1978

1. Overall Adult Learning Participation

	Total	Age of Respondent: Under 25	25-34	35-44	45-54	55-64	65 & Over
Participated in Educational Activity in the Past Year[1]	20%	24%	27%	21%	21%	13%	8%
Attended a College or University on a Part-Time Basis	5%	5%	10%	6%	3%	1%	1%
Took Classes or Organized Instruction in Public or Private Elementary, Secondary, or Area Vocational School	4%	10%	4%	3%	4%	1%	1%
Took Job Training Classes	6%	9%	10%	8%	5%	3%	1%
Took Classes or Organized Instruction in Neighborhood Center, Business, Church, or Other Community Organization	6%	4%	7%	5%	5%	6%	5%
Took Private Instruction such as Music or Language Tutoring	2%	2%	3%	3%	2%	1%	--
Took Other Organized Educational Activities	2%	2%	2%	2%	4%	2%	1%
Attended a College or University on a Full-Time Basis	6%	22%	5%	1%	1%		
No Learning Participation in Past Year	75%	58%	68%	78%	80%	87%	92%
Total	100%	100%	100%	100%	100%	100%	100%

2. Categories of Courses Taken

	Total	Under 25	25-34	35-44	45-54	55-64	65 & Over
Vocational Subjects	40%	41%	39%	39%	50%	27%	10%
Hobbies and Recreation	16%	12%	20%	14%	12%	14%	24%
Religion	11%	4%	6%	16%	10%	31%	53%
General Education	19%	25%	19%	15%	19%	11%	7%
Home and Family	5%	5%	8%	4%	2%	9%	7%
Personal Development	7%	7%	6%	8%	6%	7%	
Public Affairs	1%	2%	2%	1%	3%	--	
Total	100%	100%	100%	100%	100%	100%	100%

3. Where Courses Took Place

	Total	Under 25	25-34	35-44	45-54	55-64	65 & Over
School or College Building	46%	68%	51%	45%	33%	22%	15%
Church	15%	5%	9%	23%	15%	41%	43%
Community Center	14%	9%	18%	6%	12%	27%	29%
Private Home	9%	5%	8%	7%	16%	11%	3%
Place of Work	8%	5%	9%	10%	13%		3%
Other	8%	8%	6%	9%	15%		8%
Total	100%	100%	100%	100%	100%	100%	100%

4. Type of Organization Where Courses Taken

	Total	Under 25	25-34	35-44	45-54	55-64	65 & Over
Community Organization	24%	13%	22%	26%	17%	55%	74%
Public Four-Year College or University	24%	25%	28%	26%	18%	14%	15%
Public Grade School or High School	12%	24%	7%	2%	18%	9%	
Employer	9%	6%	9%	11%	11%	12%	
Other[2]	9%	6%	7%	7%	17%	3%	9%
Tutor/Private Instructor	5%	7%	3%	3%	10%		
Public Two-Year College or Vocational Institution	4%	2%	3%	12%	3%		
Private Vocational, Trade or Business School	4%	2%	7%	4%		5%	
Private Four-Year College or University	4%	4%	8%	2%	1%		
Area Vocational School Operated by Local School Dist.	3%	8%	3%	2%			
Professional Organization	3%	2%	1%	5%	5%	2%	2%
Don't Know	--		1%				
Total	100%	100%	100%	100%	100%	100%	100%

5. How Class was Conducted

	Total	Under 25	25-34	35-44	45-54	55-64	65 & Over
Lecture	50%	48%	49%	47%	52%	40%	64%
Seminar or Discussion Group	26%	10%	23%	39%	22%	53%	47%
(Hands-On) Shop or Lab Class	24%	23%	26%	27%	22%	11%	20%
Individual Instruction	14%	18%	15%	14%	11%	10%	7%
Organized on the Job Training	5%	11%	6%	2%	3%	2%	
Correspondence	4%	2%	2%	1%	11%	5%	
TV or Radio	1%			3%	2%		2%
Other	--	1%			--	2%	
Total	100%	100%	100%	00%	100%	100%	100%

Source: A. C. Nielsen survey of Adult Learning Participation, September 1978. Weighted statewide sample of 9,298.

[1] Includes only part-time activities. Activities add to more than 20 percent due to multiple responses.
[2] Other includes correspondence courses and out-of-state short term job training, for example.

approximately 14,000 students at some 300 other schools are taking home-study courses based on the Dallas college's tapes. Typically, the programs developed for sale or used in this country by these institutions are high demand introductory and intermediate programs rather than low demand advanced courses.

Plans for the National University of the Air have received much attention. Former U.S. Ambassador to Great Britain and founder of TV Guide, Walter Annenberg has pledged grants of $10 million per year for fifteen years to the Corporation for Public Broadcasting to develop a project to support the production of high quality college-level courses. Also in the planning stages is an "American Open University" proposed by the University of Mid-America, a regional consortium of eleven state universities in seven midwestern states.

Some institutions also offer programming by radio, such as Jersey City State College's Telecollege and Michigan's Community College of the Air.

Public television in Indiana carries some programming developed by these out-of-state sources. For example, Channel 20 in Indianapolis is carrying five courses from the University of Maryland this fall, including a survey course in Social Psychology, an Introduction to Philosophy, Systems Management, expository writing, and a course entitled, "People and Organizations."

All of the public institutions in Indiana offer degree credit instruction by television using IHETS*, public television, and cable. The courses offered include those produced by other institutions and organizations, such as England's BBC, and those produced locally. Examples include IUPUI's use of a BBC course on drama adapted by Miami-Dade Community College, IVTC's "Making it Count," an introduction to data processing, Vincennes University's introductory course in earth sciences, and a joint offering on learning disabilities sponsored by Ball State University, Indiana Central University, Indiana State University, and Purdue University.

Discussion Items B, C, D and E describe cable TV, public TV, and instructional television in more depth.

Adding New Services: Continuing Professional Education

There are numerous examples of continuing professional education offered by television, such as in dentistry, education, medicine, and nursing at Indiana University, and audiology, engineering and pharmacy at Purdue. Other institutions are also active in offering such opportunities by means of IHETS, public television, and closed circuit teleconferences. IHETS links by cable, microwave, and ITFS (Instructional Television Fixed Services), and public television links by satellite, mean that programming can be directed to particular sites and audiences.

*IHETS other capabilities are described in an attachment.

Computing Technologies for Instruction and Information Services

The use of computers for the storage and manipulation of data is well-known. Word and data processing systems are becoming common to business offices and schools alike. Not as well known, though, are particular uses of computer technology such as the ERIC (Educational Resources Information Center) System, the Lockheed commercial data base, FACTS (Fast Agricultural Computer Terminal Service), INDIRS (Indiana Information Retrieval Service), and TEDS (Training and Education Data Service). These are interactive data bases which contain reference information for guidance and decision-making.

Another use of computer technology is for instruction or for processing data. Examples include INCOLSA (Indiana Cooperative Library Services Authority) which links Indiana's institutions of higher education with OCLC, the card cataloging system for collegiate libraries; CAD/CAM (Computer Assisted Design/Computer Assisted Manufacturing) technologies; and PLATO, one of the more advanced forms of interactive terminal systems for learning. PLATO is being used to teach language, mathematics, programming, music, and other skills at both the remedial and college level. In some communities, there are now commercial PLATO centers. See Discussion Item F for a description of PLATO use at Indiana University - Bloomington.

Community Interest Educational Programming

Community organizations such as libraries, museums, the Red Cross, and television stations themselves offer televised programming that is

educational. Examples include (1) the Monroe County Public Library, which operates its own cable television channel and provides specialized programs for both children and senior citizens, an on-line computer-based calendar of community activities, and live coverage of local government meetings and community activities; (2) the Indianapolis Museum of Art, which produces short news features and public service announcements for commercial television, continuing education films for the public at large, and training films for museum personnel; and (3) Channel 20's telecourses which are viewed by many more than those who register for college course credit. Material about the Monroe County Public Library and Channel 3 in Bloomington are attached as Discussion Item G.

Issues to be Considered

The uses of audio, video and computing technologies raise issues which should be considered. The following questions are based on several of these issues.

> How do these technologies compare to each other and to traditional forms of instruction in terms of effectiveness and cost?
>
> Why have educational institutions been slow to use these technologies for on-campus degree credit instruction?
>
> What special problems of quality control and accreditation exist with regard to offering degree credit instruction by means of these technologies?

What issues of governance and institutional responsibility are raised by the use of these technologies?

What issues of state responsibility for access and student aid are raised by the use of these technologies?

What issues with regard to institutional missions are raised by the availability of telecourses and these technologies?

What should the state's role be in encouraging the use of these technologies for instruction at introductory, intermediate, advanced, and continuing professional education levels?

Discussion Item: B

Cable TV

There are approximately 82 cable TV companies in Indiana. Table I shows the location, type of TV market, number of subscribers, and the channel capacity. According to local reports, there is at present only a minimal amount of instructional programming on cable TV, but great potential for more.

The following description of cable TV is quoted from the Storer Broadcasting Yearbook 1980.

A "short course" in cable, 1980

There are 4,200 operating cable systems in the U.S., serving some 10,200 communities. Another 1,300 systems are approved but not built. Pennsylvania has the most systems (334) and California the most subscribers (2 million). Operating systems currently reach about 15.1 million subscribers, perhaps over 44 million people - 20% of the nation's TV households. The largest (Cox Cable in San Diego) has about 170,000 subscribers. Some have fewer than 100. Teleprompter is the largest multiple system operator (MSO), with more than 1,182,000 subscribers. Industry revenues last year totaled approximately $1.4 billion. Most systems offer 12 channels. Systems constructed after March 1972 must have a minumum 20-channel capacity. The average monthy fee is $8, and the average pay subscriber fee is $8.50 per month. Costs of laying cable range from $8,000 per mile in rural areas to $12,000 in urban areas and up to $80,000 where underground cable is required. An estimated 2,800 systems originate programing in their own studios, the average for 23 hours weekly. Equipment costs are as low as $30,000 for a small black and white operation and $200,000 for a color studio. Over 2,900 systems (70% of all systems) accept advertising on their local origination channels, with rates from $5 to $300 dollars per minute. Most cable systems derive less than 5% of their gross revenues from advertising. Pay cable is on approximately 2,000 systems and reaches 5 million subscribers in 49 states. Most pay cable operators are reporting close to 25.3 penetration of their subscriber count. Home Box Office Inc. initiated the first national satellite interconnected pay network September 30, 1975, using transponder time leased on the Satcom satellite. Aside from contracting for packaged pay programs, like HBO, cable operators can lease a channel to a pay program operator or secure their own programing directly from a supplier. Over 30% of all cable systems have ties with broadcast interests, almost 18% with program producers and approximately 13% with newspapers. Many systems have multiple cross-ownership ties.

Table I
Cable TV in Indiana
by Location

Location	Top-100* TV Market	Outside All TV Markets	Smaller TV Market	Subscribers	Total Channel Capacity	Available Unused Channels
Anderson	X			12,600	12	
Angola		X		880	12	
Attica		X		2,000	12	
Auburn	X			2,250	21	9
Batesville		X		N/A	N/A	
Bedford	X			4,000	12	
Bloomfield	X			475	12	2
Bloomington	X			7,300	12	
Bluffton	X			1,100	20	
Boonville	N/A	N/A		1,036	12	1
Brazil			X	975	20	1
Brookton	X			612	12	
Brookville	X			N/A	12	2
Carmel	X			2,399	27	
Clark County	X			3,700	30	18
Clinton			X	1,370	10	
Columbus	X			5,202	21	7
Connersville		X		4,629	13	
Corydon	X			500	20	11
Covington			X	914	12	
Crawfordsville			X	3,766	12	
Cumberland	X			N/A	N/A	
Decatur	X			N/A	N/A	
Delphi			X	756	12	1
Dugger			X	63	12	2
Elkhart	X			9,377	30	19
Elwood		X		1,545	12	
Evansville	X			N/A	27	15
Fort Wayne	X			N/A	35	
Fortville	X			N/A	N/A	
Fowler			X	685	12	1
Franklin	X			1,334	27	16
Gary	X			N/A	N/A	
Greencastle			X	1,053	12	1
Greenfield	X			1,259	27	16
Greensburg		X		1,093	27	
Hammond	X			N/A	N/A	
Huntington	X			N/A	12	
Jasper		X		3,349	12	
Kendallville	X			1,480	30	18
Kokomo		X		17,200	11	
Lafayette			X	22,344	13	
Lawrenceburg	X			2,500	27	15
Lebanon	X			1,219	12	
Ligonier	X			560	30	18
Linton	X			970	12	1
Logansport	X			7,211	12	

Table I
Cable TV
page 2

Location	Top-100* TV Market	Outside All TV Markets	Smaller TV Market	Subscribers	Total Channel Capacity	Available Unused Channels
Madison		X		2,542	12	2
Marion	X			13,400	12	
Marion County	X			N/A	35	13
Martinsville	X			1,550	27	
Mishawaka	X			4,530	30	18
Mitchell	X			600	12	1
Monon			X	617	12	
Monticello			X	2,126	12	2
Mount Vernon	X			N/A	7	
Muncie		X		N/A	26	14
New Castle		X		3,462	12	2
New Haven	X			6,900	35	27
Peru		X		6,950	20	
Plymouth	X			948	30	19
Portland		X		2,175	12	
Princeton	X			1,274	7	
Remington			X	485	12	1
Renssalaer		X		1,753	12	
Richmond		X		9,500	27	15
Rochester		X		1,354	30	18
Rushville		X		661	12	1
Salem	X			1,200	20	8
Seymour		X		3,037	12	
Shelbyville	X			1,200	12	
South Bend	X			20,892	30	17
Sullivan			X	1,114	12	2
Tell City		X		2,275	12	2
Terre Haute			X	13,100	12	
Union city		X		1,754	12	
Valparaiso		X		N/A	N/A	
Vincennes		X		10,750	13	
Wabash	X			4,000	20	7
Warsaw	X			2,352	12	
Winamac		X		627	21	9
Winchester			X	1,597	12	2

Source: Broadcasting - Cable Yearbook 1980, Storer Broadcasting Company

*Note: A CATV system is within a TV market if any part of the system falls within 35 miles of a commercial TV city-of-license.

Discussion Item: C

Public TV*

A. Instructional Broadcasting

What we know as Public Broadcasting was originally called educational or instructional broadcasting. This use of radio and television is still a strong and growing component of our noncommercial broadcasting system. Understanding how instructional broadcasting came about also involves understanding the regulated spectrum or channel space that broadcasters occupy. Broadcasters send their picture and sound in the form of a wave out over the air. It is this wave that your radio or TV antenna picks up and sends into your receiver. You use your tuner to select that channel, and it is displayed through your set. When broadcasting was first available, radio and TV buffs could transmit their signals at will. Unfortunately, they all began to interfere with each other in an electronic cacophony that served no one.

The government intervened, in 1927, to limit the number of channels on the spectrum in any given area, so that clear reception was guaranteed. This channel limitation or "scarcity" then became the basis of government regulation to insure that broadcasters used

*Most of this text is from "Calling the Tune: Communication Technology for Working, Learning, and Living," by Ted Carpenter, National Institute for Work and Learning, 1980.

this limited resource as a public interest trust and not a private monopoly. This helped to insure a "diversity" of ideas. In 1952, the government again intervened to increase diversity in broadcasting by setting aside a number of local channels for noncommercial or what were then assumed to be nonprofit instructional or educational stations.

The sponsor/editor/audience mix tells us a lot about what was accomplished with this new resource in the instructional field. The licenses for instructional stations went primarily to schools and universities. Their sponsors became Federal, state and local governments through their educational budgets, foundations, local school budgets, and private or viewer contributions. These sponsors had both curricular and social policy objectives. The Carnegie and Ford Foundations, in particular, began to explore the promise of this technology for improved education, lifelong learning, and journalistically distinct uses of broadcasting for citizen education.

Because of the broader range of sponsorship, the editorial function became much more distinct than in commercial broadcasting. Educators and media producers were free to concentrate on the educational needs of their audiences. However, from its earliest days, instructional broadcasting has had an editorial split between those who feel television and radio are best suited to more general and non-traditional forms of educational and those who advocate more rigorous and credentialed approaches tied to a curriculum.

Additionally, the Federal government, in granting the noncommercial licenses to promote diverse resources for public communication, also took a curious slap at its editorial independence with a restriction that remains to this day; noncommercial stations may not "editorialize" by endorsing political candidates or points of view, even if they operate without government money.

Audiences quickly developed a different relationship to instructional broadcasting, for here fragmentation is welcomed and small group educational needs catered to. Many have become financial supporters or volunteers and enroll in courses to sustain this struggling medium now completing its second decade. In sum, instructional television has learned to serve small but loyal audiences. However, given the expense of broadcasting and the commercial competition, the small, fragmented audiences provide a weak political and financial constituency to attract adequate funding.

In spite of internal conflicts and snubs from both traditional educators and commercial TV producers, this struggling industry has gradually proven it can deliver instructional services that are often as effective as standard curricular approaches. This system is not strong on mass entertainment and news, but is wholly committed to the remaining education, training, and service criteria within the limits of small broadcast audiences.

Leaders in instructional television have also been pioneering in uses of their broadcast medium for the education of working adults in non-traditional forms, using the distribution mechanism of a broadcast signal to bring educational resources to the home and workplace in order to involve adult learners who do not have access to traditional forms of curricular study. However, instructional television has had to struggle against the contradiction that its ability to expose adult learners to educational services is not always matched by an equal ability to provide sufficient support services and the certification necessary to assure wary employers and educators of levels of achievement and competence resulting from the use of these services by adult workers and learners.

The experience of Kentucky Educational Television demonstrates that progress is being made. The KET/GED series was designed and produced in 1974 to assist the adult who had not finished high school by preparing him to take the GED examinations. The series was developed entirely by state and regional funds and distributed nationally in 1975 by the Cambridge Book Company. HEW and other Federal funders did not provide support, because they were uncertain that the system "would teach," were doubtful it could reach the non-high school-certified adult, and were not sure the GED test would be continued.

Six years later, the KET/GED series is being used in 40 states by over 400 different learning institutions. In Illinois, 35 of the 48 community colleges, 4 of the 6 PBS affiliates, all correctional

institutions, the city community college system, and all libraries in Chicago provide the service. In one study where the GED series was the only variable, referrals to the GED exam increased 27 percent, the pass rate increased 4 percent, and the quality of the pass work increased 22 percent. The Chicago public television station found that its series was viewed by 75,000 viewers. Since the achievement of high school certification increases the salary of the average adult by $1,200 annually, this is no small contribution to worker education needs. Other examples are cited in Attachment D.

B. Public Broadcasting

In 1952, when noncommercial channels were set aside by the government, another kind of station began to form along with instructional stations. One of the first was KQED in San Francisco. Rather than affiliate with a school, it formed an independent community board, along the lines of the then fashionable cooperative movement, and took for its editorial focus the needs of the broad public outside of instruction. KQED was, and still is, a leading innovator in public noncommercial programming and is one of many stations that began to grow apart from their instructional brethren.

The Carnegie Commission on Public Broadcasting was formed in 1967 to examine the growing potential of noncommercial television. When it issued its report, the Commission sided firmly with the broader public focus beyond instructional and, in fact, coined the term

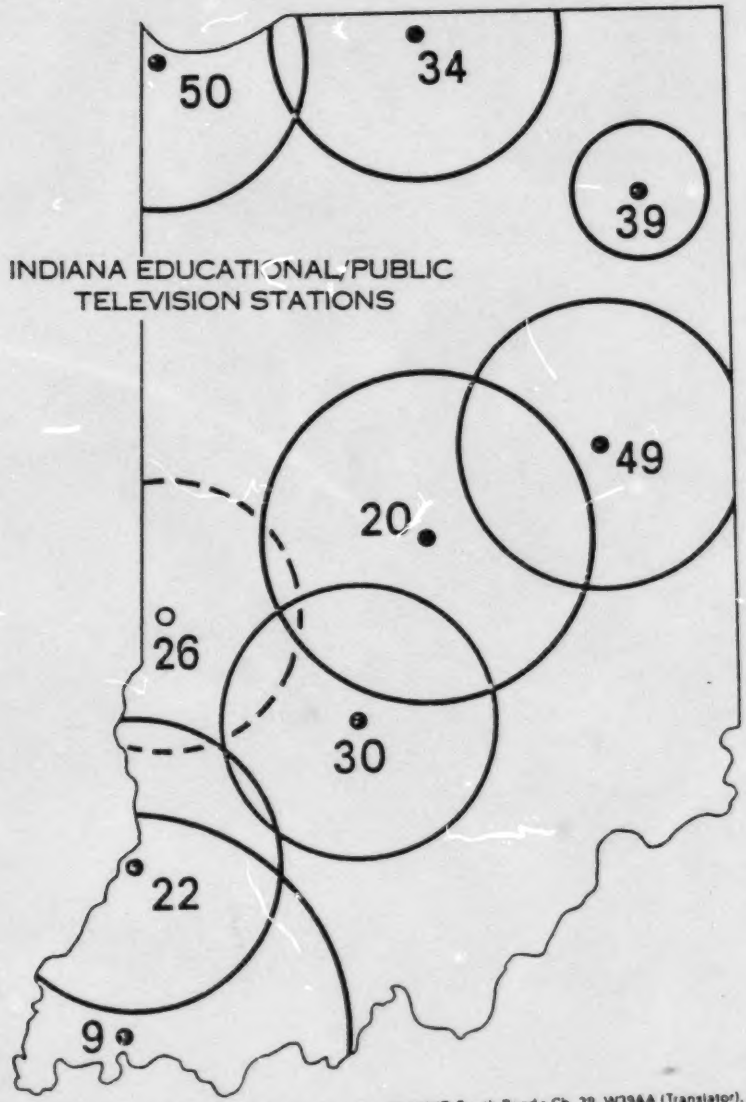
"public" broadcasting. They proclaimed the potential of broad social and educational objectives to bring general public culture and enlightenment to all Americans. They called on the simple eloquence of E. B. White, who said public broadcasting would be "our lyceum, our Chautauqua, our Camelot." The Chatauqua movement, in fact, was an early innovation in the lifelong learning tradition and citing it showed the Commission's focus on public forms of non-traditional study through broadcasting.

C. Public TV in Indiana*

The sponsorship of public broadcasting includes funds from governments, foundations, corporations, and private or member contributions. In Indiana, the General Assembly has appropriated $40,000 per year during 1981-82 and 1982-83 for the eight public TV stations. In 1980, the General Assembly appropriated $475,000 for the acquisition of equipment interconnecting all public television stations in the state by satellite. Under this project, each station will have a capability for beaming programs it originates to a satellite from which it will be received by the other stations. The result will be an all-Indiana network featuring programs of special Indiana interest.

*Most of the following text is from the February 1981 Report to the General Assembly of the Indiana Public Broadcasting Society.

The Indiana stations include three -- at Bloomington, Muncie, and Vincennes -- licensed to state universities; one -- at St. John in Lake County -- licensed to a community school corporation; and three -- at Evansville, Indianapolis, and South Bend -- licensed to community not-for-profit corporations. Fort Wayne's low-powered translator station also is licensed to a community corporation (See Chart).



Ch. 50, WCAE, St. John • Ch. 34, WNIT, South Bend • Ch. 39, W39AA (Translator), Fort Wayne • Ch. 49, WIPB, Muncie • Ch. 20, WFYI, Indianapolis • Ch. 30, WTIU, Bloomington • Ch. 22, WVUT, Vincennes • Ch. 9, WNIN, Evansville. (Applicant - Ch. 26, WISU, Terre Haute.)

Together, their broadcast signals reach 4,622,300 Indiana citizens, or 85 percent of the state's population. Thousands more receive them by cable TV. Hoosiers who tune in regularly to Public TV are estimated at 2.3 million. Each station broadcasts an average of 100 hours of programs weekly, or almost 40,000 hours yearly.

Volunteerism is also a badge of the public television stations. Popular community support was marked in Fiscal Year 1979 by $1.5 million in membership donations and auction income, or 31.7 percent of their total cash income. Additionally, program underwriting and contributions by foundations and business and industry represented $350,893, or 11 percent of total income.

Public funds included federal grants of $1,864,682, or 38.4 percent; a direct state grant of $280,000, 5.7 percent; and state university funds to university-licensed stations, $643,225, or 13.2 percent.

Instructional television—Higher education without commercial interruption

Carol Hermstadt Shulman

Instructional television is emerging as a potentially important tool for reaching student audiences in postsecondary education. In 1978-79, more than 1,800 colleges and universities used television for instruction, and 735 institutions offered complete courses over television. Some 6,884 courses were offered, enrolling nearly half a million students (Higher Education Utilization Study 1979).

But these figures are small compared to the audiences that instructional television's supporters believe can be reached. Thus, the audience could be as large as 64 million—the total high school graduate population over 25 years of age that has not completed college. Of this group, 6 million are in college and an additional 12 million have taken some college but currently are not enrolled. Instructional television is particularly appropriate for the individuals in this population who are highly motivated learners and have good basic learning skills.* Most often, persons with these characteristics are mature adults (Zigerell 1979). As this segment of the nation's population grows, colleges and universities are taking an increased interest in programs directed to these prospective students. Such interest combines with new technologies, new course materials, and new cooperative arrangements among producers and users, to promote a growing use of instructional television.

History of instructional television

Current interest in instructional television recalls its early heyday during the 1950s when 114 colleges and universities teamed up with television stations to present televised college lectures (Carlisle 1974). From this optimistic beginning, instructional television fell into a decline, leaving only a few survivors such as CBS-TV's "Sunrise Semester" and the City Colleges of Chicago's TV College.

The reasons for the disappearance of much of this programming are instructive. First, before the advent of videotape, television programs were broadcast live and stations provided studio time for instructional television only at hours inconvenient for potential students. Videotape provides greater flexibility in determining when courses may be offered. Second, even when good broadcasting time was available, there often was not enough courseware produced to attract students interested in courses for credit. And third, producers overestimated the potential student audience in a given geographic region and did not realize that long-term instructional programming must draw from a heavily populated region in order to net a sufficiently large student audience (Zigerell 1979).

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As an example of successful instructional television, Chicago's TV College overcame these problems and boosted its popularity in other ways. It provided a real off-campus alternative for the Chicago-area population, enabling persistent students to build substantial credit towards or even complete an associate of arts degree. It also wisely recognized that a course should be offered at spaced intervals rather than in successive terms to prevent enrollments from dropping precipitously from one term to the next (Zigerell 1979).

The instructional television of the 1950s and 1960s might not appeal to today's more sophisticated television audiences. The "talking head" approach dominated television courses, presenting a professor lecturing as if before a class. Gradually, however, producers began to use the medium more effectively by providing dramatizations of the subject, adopting a documentary format, and eventually, developing the telecourse concept (Zigerell 1979).

Telecourses

The telecourse represents the most recent stage in the evolution of instructional television, and it is rapidly becoming the dominant mode in the field. Telecourses combine often-sophisticated television programs with related printed materials to produce a unique educational experience:

> a telecourse "is an examination and presentation of a body of knowledge and information through the use of sight, sound, color, movement, and print in a manner designed to stimulate and increase involvement and clarify and quantify a carefully designed and validated series of learning objectives." (Mittelstet 1979 quoting Gripp)

Telecourses may originate either as "courses for television" or as "courses from television," also called "wrap-around courses" (Munshi 1980). In the first instance, the telecourse is produced for instruction and is typically on a standard academic subject such as government or biology. The user institution arranges for rental, lease, or purchase of the course and for broadcast time, which usually is not during prime time. Printed materials are developed in conjunction with the video component. In contrast, the "wrap-around" course is a television series that was produced originally for a general audience and was broadcast during prime time on either a commercial or a Public Broadcasting System station. Its content and academic quality, however, make it suitable for instructional purposes. Therefore, printed course material is developed around the original program (Munshi 1980). In either instance, the telecourse is usually about 15 hours long, either as 30 half-hour segments or as 13 to 15 one-hour segments.

Although the television program is at the heart of the telecourse concept, printed materials and other educational activities also are essential. The basic complement to the video program is the study guide, which provides the student with learning objectives for each program and for the entire course. The study guide also includes self-graded pretests, study questions for the television program and for reading assignments, enrichment activities (required and optional), and self-graded or mail back graded posttests (Mittelstet 1979; Munshi 1980).

Campus liaison is necessary in the telecourse concept. The extent of student-faculty relations depends on how the individual institution decides to organize and administer the telecourse.

*Peter J. Dirr (projects manager, Educational Activities, Corporation for Public Broadcasting) December 9, 1980; conversation with author.

Contact may be limited to a final exam but usually includes other graded tests as well as several optional review sessions on campus or in a community location. In addition, many institutions arrange for telephone contact or on-campus meetings with faculty overseeing the course (Mittelstet 1979).

Other telecourse components vary according to the demands of the subject and the complexity of the telecourse design. They may include a textbook, required and optional readings, and learning activities such as an optional museum visit for a course on the arts or required on-campus and mail-in compositions for an English composition telecourse (Mittlestet 1979). One experienced producer of telecourses notes that "the curriculum and materials must provide a flexible framework around which faculty members are free to add or revise study materials" (Gross 1978a, p. 10, quoting Bousma)

Current uses of instructional television

Colleges and universities make extensive use of on-campus, closed-circuit television systems for instruction (Higher Education Utilization Study 1979). However, few direct substantial effort to broadcasting instructional television to off-campus audiences. Colleges and universities generally are not taking advantage of the new developments in technology and programming that can reach adult audiences who are unable or reluctant to come to campus for instruction. This conclusion applies more to four-year institutions than to the two-year colleges:

> . . . forty-one percent of all four-year public institutions which use TV for instruction rely solely or primarily on closed circuit systems. Those institutions generated seventy-six percent of the TV course enrollments reported by four-year public colleges. On the other hand, . . . sixty-five percent of the total enrollments [in television courses] were generated by two-year colleges which work solely or primarily with public TV stations. (Higher Education Utilization Study, 1979, p. 20)

Four-year institutions fail to make more effective use of off-campus instructional television for two principal reasons: lack of respect for such instructional methods and lack of institutional support. In the first instance, faculty, administrators, and students believe that television for off-campus instruction provides "education inferior in quality to that provided by traditional on-campus programs" (Hershfield 1980, p. 48). Surveys taken in 1979 of public and private four-year institutions asked whether faculty members were or were not supportive of the use of television for instruction. (The survey results did not distinguish between on- and off campus instructional television.) In the public sector 40 percent of the respondents cited lack of faculty support as a factor preventing the use of instructional television, and 33 percent in the private sector concurred (Dirr and Pedone 1979a and b). With regard to institutional support, the 1979 surveys showed that lack of such support services as faculty contact, flexible registration procedures, was equally a hindrance in the use of television (Dirr and Pedone 1979a and b).

These barriers to greater use of instructional television are inherent in the current system of course development and course financing that dominates four-year institutions (Hershfield 1980). Traditional methods of course development involve one faculty member devising a course, often while teaching it. The salary for the course development and the teaching salary are one and the same. In contrast, production of a sophisticated instructional television course involves long-range planning, team production, and a substantial capital outlay. Most institutions are not geared up for this type of enterprise (Hershfield 1980).

Video technology

Rapid developments in video technology cause telecommunications observers to believe that a "communications revolution" will occur in this country over the next ten years (Bonham 1980a, p. 2; Smith 1978a). One factor in this revolution is the increasingly greater flexibility in the delivery of video programs. That is, new satellite transmission systems, expansion of cable systems, and new home video systems provide the public with more opportunities for home viewing.

Satellites. Satellite transmission systems hold the key to the development of the communications revolution. These satellites

> provide a means of transmitting signals across great distances, obviating the need for complex systems of terrestrial microwave and/or wire relays. Thus, they greatly decrease the cost of both long-distance transmission, and transmission from a single source to many receiving sources spread over a large geographic area. (Smith 1978a, p.10)

This great advantage is becoming recognized. In 1974 there were only a few cable television systems, linked together by terrestrial microwave. By 1979, more than 2,000 cable systems were participating in a satellite-interconnected network (Mahoney, DeMartino, and Stengel 1980).

For instructional television, the satellite transmission to cable networks can be a real boon. For example, the Appalachian Community Service Network (ACSN), which provides instructional television programming, can serve any cable system in the country via satellite and currently serves 50 systems, more than half of which are in the Appalachian region. ACSN now has about 500,000 subscribers and plans for rapid development of its system.*

Narrowcast technology. Narrowcast technologies provide for a variety of methods for the interested learner to gain access to instructional television. "Narrowcast" refers to the transmission of a television signal from a transmitting station to a limited number of receivers. (In contrast, broadcast transmissions go to an unlimited number of receivers.) Cable television, instructional television fixed service, and videodiscs and cassettes are examples of narrowcasting. These technologies may make the production of instructional programs for specific groups of learners more economically feasible. For example:

> A market audience of 100,000 people who wish to take a videodisk course on psychology . . . would more than pay for itself, remembering that . . . under conditions of high-cost open television, half a million Americans take public television courses for credit. (Bonham 1980b, pp. 35-36)

Cable television. With cable television, the television signal is disseminated by wire instead of over the air. A cable system may contain more than 100 channels. Cable companies are granted franchises by local governments to wire their communities and deliver programming. Currently, there are about 4,000 cable systems serving 9,000 communities and 40 million people (Baltzer 1980).

Originally intended to provide a better reception and choice of channels in rural areas, cable television is rapidly moving into urban areas (Smith 1978b). This development is significant for instructional television since urban locations provide new opportunities for reaching large audiences via cable. Further, most cable franchises stipulate that the cable system must provide for educational access.** The number of channels available on cable affords multiple opportunities for instructional television. In addition, cable television may encourage "participation by colleges and universities in creating and producing programs designed for the social, cultural, civic, business, and industrial

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needs of their community" (Smith 1978b, p. 16). Analysts project that by 1985 cable television will have about 450,000 education subscribers (Bonham 1980b).

Instructional television fixed service. Under a Federal Communications Commission (FCC) ruling, 28 channels have been set aside in the microwave part of the electromagnetic spectrum for educational institutions' use. These 28 channels are known as Instructional television fixed service (ITFS). An individual institution may obtain an ITFS license from the FCC to operate up to four video channels plus audio channels to allow two-way communication.

The microwave frequency extends for only about 25 miles, so the FCC may assign the same channel to geographically separate institutions around the country (Smith 1978b).

Institutions holding ITFS licenses may transmit television programs to predetermined reception points in the community, such as industrial sites, hospitals, or schools. The two principal advantages of ITFS are its multi-channel capacity, which makes it possible to transmit several programs simultaneously, and its interactive capability. Viewers of an ITFS program can respond to a presentation by pressing a response button that sends their message to the transmission point (Baltzer 1980). The University of Southern California, for example, has an interactive instructional program that transmits live courses on campus to industrial facilities in the Los Angeles area. Students at these sites, usually company conference rooms, respond to the instructor and to their fellow students on campus by ITFS or teleconferencing. A daily courier service delivers class material and homework (Baltzer 1980).

Videocassettes and videodiscs. Personal video systems made possible by the advent of videocassettes and videodiscs offer new opportunities for individualized instruction. Home videocassette player/recorders have been on the market for several years and a large number of movies and programs, as well as professional development courses in several fields, are available on videocassette. Videodiscs are a newer development—thin plastic discs that use a special player. According to projections, 10 percent of the television households in America will own videodisc or videocassette equipment by 1985 (Mahoney, DeMartino, and Stengel 1980).

These technologies bring instructional television to the individual level, as students learn to use videocassettes and discs on their own time schedule, as they would books, rather than remain tied to a broadcast schedule (Rice 1980). In addition, this individualized approach

> will ultimately mean viability for programs that satisfy more highly specialized interests and tastes than any other national programming medium. As with today's audio recordings, the home video market allows thousands rather than tens of millions of viewers to be targeted with programming. (Mahoney, DeMartino, and Stengel 1980)

Economic factors

The cost structure for telecourse instruction differs significantly from that of traditional on-campus instruction. About 70 percent of the costs of instructional television are associated with acquiring and modifying the instructional materials and providing programs. Approximately half of this amount—35 percent of the total costs—goes for air time and faculty salaries. Institutional support services make up the final 30 percent of total costs.

With traditional instruction, however, faculty salaries account for 45 percent of the total costs, while only about 5 percent goes for instructional materials. The other 50 percent of costs is for institutional support services (McCabe 1979).

Thus, enrollment is the key in determining how expensive telecourse instruction will be:

> In traditional instruction the enrollment in any course, beyond some minimum, is not critical. Each enrollment results in a similar cost, as sections are added or cancelled, based on an expected mean class size. In television-centered programs enrollment is of central concern, as most of the expenditures are committed regardless of enrollment, and each enrollment adds very little cost. (McCabe 1979, pp. 30-31)

Therefore, to make the cost of an instructional television course comparable with the cost of a traditional course, the former must have a much larger enrollment.

Hershfield (1980) analyzes the cost differences between producing a high-technology course and a traditional course. The high-technology course involves the development of videocassettes, audiocassettes, and sophisticated written materials, and costs about $54,000 per year over a five-year period, excluding faculty salaries. (Five years is considered the useful life of a high-technology course.) A traditional course, on the other hand, costs about $21,000 per year in faculty salary. Hershfield concludes that to make credit-hour costs equal between the two courses would require that the high-technology course enroll 2,333 students over the five years, compared to the 600 students typically taught in a traditional course over the same period.

To recoup the high production costs, then, an institution producing a telecourse needs to go beyond its own campus and lease the telecourse to other institutions (McCabe 1979). For example, a sociology course now in production for the Dallas County Community College District will cost about $350,000 to produce and needs an enrollment of about 4,500 to 5,000 in the District as well as leasing earnings to recover its costs over its five-year life. The District has succeeded in covering the expenses of similar courses and expects to meet the expenses of this course also.***

The leasing fees charged to user institutions vary depending on the broadcast delivery system, the type of videotape, and student enrollment. For one of its telecourses, Dallas County District charges a flat $6,000 or $2,750 plus $10 per student enrolled in the first semester of the course, if open broadcast delivery and two-inch videotape are used. The second semester charge is $1,500 plus $10 per student enrolled, or a flat fee of $3,500.

In deciding whether to invest in leasing a telecourse, an institution has to weigh a host of cost factors, in addition to the leasing charges, against potential student enrollment. Some considerations are:

- Does the institution pay for air time?
- Does it have to generate enough income from tuition/FTE reimbursement to cover other than "out of pocket" expenses, if so, what is included?
- [Does it] have control over the tuition funds generated or do they go into the general fund of the state?
- Does it receive state or grant support in any form?
- How much does it pay faculty to teach telecourses?
- What is the competition in the immediate area for students? (Munshi 1980, p. 23)

Consortia

Colleges actively involved with telecourses may form consortia to produce high-quality programs or to arrange for more efficient use of the available telecourses. These consortia may be organized on an ad hoc basis to work on the development of a single

*David Buckingham (coordinator, Cable Operations, ACSN) January 5, 1981 conversation with author.

**Frank W. Norwood (executive secretary, Joint Council on Educational Telecommunications) January 5, 1981 conversation with author.

***Rodger Pool (director, Instructional Television, Dallas County Community College District) January 21, 1981 conversation with author.

telecourse or they may be permanent groups overseeing long-range development of the production or use of telecourse material.

From the production side, consortia offer attractive benefits to participating institutions. The cooperating institutions develop a course that meets their needs, guaranteeing a substantial market for the telecourse. Pooling resources makes available a larger budget for production, so that a high-quality course can be developed. And institutions involved in the consortia have free use of the telecourse (Gross 1978a).

One such collaborative effort several years ago produced a telecourse on American government. Four institutions participated: Dallas County Community College District (DCCCD), TV College in Chicago, Coast Community College in southern California, and Tarrant County Junior College District in Texas. DCCCD took the lead in this consortium, contributing 67 percent of the original budget, retaining complete control over the work, and providing the production staff. All institutions contributed a full-time faculty member for writing a course "narrative" from which the television script was produced, as well as a study guide, lessons, and tests (Gross 1978a).

The resulting telecourse provided a unique perspective on American government:

> "To accommodate requirements for study of state government that vary from state to state, the consortium members have incorporated a comparative approach to state government . . . Content experts . . . were able to set up . . . case examples and interviews with key officials that would have been difficult for us to set up on our own. The result is a much richer, broader course in American federal and state government . . . than one which might have been produced with only local resources." (Gross 1978a, p. 2 quoting Mittelstet)

Consortial arrangements also are adopted by user institutions for purchasing telecourses. By pooling resources institutions are able to purchase more high-quality programs than any single institution could on its own (Gross 1978b; Hobbs 1980). But there are other advantages as well. Consortium members share expertise in selecting the programs and in developing study guides and other printed materials (Hobbs 1980). Moreover, by acting as a group, they have some influence over the development of telecourses, that is, they "can begin to prod producers of televised instruction towards better meeting their needs" (Gross 1978b, p. 26).

Conclusion

People in the higher education community who are knowledgeable about instructional television see the new video technology and developments in programming as evidence that instructional television will make great gains during the 1980s. They believe it may revolutionize how adults acquire access to postsecondary education. However, they see two major problems that may inhibit some institutions, especially four year colleges and universities, from actively participating in instructional television. First, the high initial costs of developing a telecourse may seem prohibitive to college administrators accustomed to more modest demands upon the college budget. However, increasing opportunities to lease courses from an expanding group of producers can significantly reduce the costs involved in telecourse instruction and should be considered a reasonable alternative.

A second barrier confronting instructional television is the reluctance of faculty to use the new technology. Often, faculty regard television for off-campus instruction as second-class (Hershfield 1980). Although attitudinal change often is difficult to achieve, some steps to encourage faculty approval of telecourses can and frequently are built into the telecourse system. Through the components of the telecourse (*e.g.*, study guide, tests, and faculty-student conferences), faculty have an opportunity to modify telecourse instruction to suit their perception of how the course should be taught.

Academic administrators and faculty need to investigate how instructional television may help them meet their institutional goals so that they can make a rational decision on whether they should use this approach. It is probable that if institutions fail to become involved in instructional television, private industry and new types of educational organizations will step in to provide educational television services to the adult population.

Information resources

Described below are several organizations involved in developing the field of instructional television or providing information on it.

■ Adult Learning Programming Department, Public Broadcasting System's Educational Telecommunications Program Service (PTV 3), 475 L'Enfant Plaza SW, Washington, D.C. 20024; Dee Brock, director. The Adult Learning Programming Department, established in July 1980, plans to make available programs to participating PBS stations and cooperating colleges. Three kinds of courses will be offered: college credit courses, informal learning courses and programs, and professional development and career training courses and programs. Participating institutions will assign the amount of credit to be awarded and provide for faculty-student liaison.

■ The Center for Learning and Telecommunications, American Association for Higher Education, One Dupont Circle, Suite 780, Washington, D.C. 20036; Marilyn Kressel, director. The Center assists postsecondary institutions in exploring the potential of technology-based programs. Projects include the synthesis and organization of information already available on telecommunications but currently scattered, a guide to major telecommunications models, and a handbook of alternative technologies.

■ Corporation for Public Broadcasting/Annenberg Higher Education Telecommunications Project, CPB, 1111 16th Street NW, Washington, D.C. 20036. Under a 15-year, $150 million grant from Walter H. Annenberg, publisher of *TV Guide*, CPB is planning to produce college-level courses through existing and developing communications systems. The funds will be used to develop telecommunications materials and courses to be offered in cooperation with higher education institutions for undergraduate degree credit.

■ Joint Council on Educational Telecommunications, 1126 16th Street NW, Washington, D.C. 20036; Frank Norwood, executive secretary. The Council is an organization of nongovernmental associations designed to monitor and inform its members about current technologies that may affect opportunities for educational television.

■ National University Consortium for Telecommunication in Teaching, University of Maryland University College, College Park, Maryland 20742; Allan Hershfield, executive director. Launched in 1980, the NUC plans to make a complete bachelor's degree program available to home-based adult students through television and the directed study learning system developed by the United Kingdom's Open University and the University of Maryland University College. To date, seven institutions are participating in the program, with broadcasts over ten local public television stations and two cable systems.

■ University of Mid-America, P.O. Box 82006, Lincoln, Nebraska 68501. Founded in the mid-1970s, the UMA is governed and administered by a consortium of 11 midwestern universities. It

has four objectives: to develop multi-media college-level courses for study at home; to conduct research on adult learning, evaluate learner response to open learning courses, and disseminate research results; to assist the consortium members in their development of open-learning delivery systems; and to distribute course materials to institutions nationwide.

■ Wayne State University, University Studies/Weekend College Program, College of Lifelong Learning, Detroit, Michigan 48202. Since 1973, WSU has offered this program that is designed especially for employed persons and homemakers. One component of this program is a television program produced by WSU and broadcast daily over Detroit stations in half-hour segments and repeated in five program blocks every Sunday during the term. Other components include a workshop, a conference course, and directed study courses, seminars, and electives.

Bibliography

Documents available through the ERIC system appear with an ED number. To order, write to ERIC Document Reproduction Service, P.O. Box 190, Arlington, Va. 22210. ED numbers must be specified. All orders must be in writing and payment must accompany order. Documents are available as indicated in microfiche (MF) and paper copy (PC).

Baltzer, J. "Expanding Alternative Delivery Systems." Unpublished paper, May 1, 1980.

Beaty, Sally V. "Forming College Television Consortia." *Using Mass Media for Learning*. Edited by Roger Yarrington. Washington, D.C.: American Association of Community and Junior Colleges, 1979. ED 165 856. MF-$1.06; PC-$8.35.

Bonham, George W. "Introduction." *The Communications Revolution and the Education of Americans*. New Rochelle, N.Y.: Change Magazine Press, 1980a.

_____."What Next?" *The Communications Revolution and the Education of Americans*. New Rochelle, N.Y.: Change Magazine Press, 1980b.

Carlisle, Robert D. B. *College Credit Through TV: Old Idea, New Dimensions*. Lincoln, Neb: Great Plains National Instructional Television Library, 1974. ED 124 160. MF-$1.06; PC-$15.20.

Dirr, Peter J. and Pedone, Ronald J. "Instructional Uses of Television by State and Land-Grant Colleges and Universities, 1978-79." September 1979a.

_____. "Instructional Uses of Television by Private Colleges and Universities, 1978-79." September 1979b.

Gross, Ronald. "The Other Open University, Part I." *Planning for Higher Education* 7(August 1978a):9-19.

_____. "The Other Open University, Part II." *Planning for Higher Education* 7(August 1978b):25-36.

Helmantoler, Michael C. *The Mass Media College Catalog. A Directory of Lower Division College Course Materials in National Distribution for Use Via the Mass Media*. Washington, D.C.: American Association of Community and Junior Colleges, 1979.

Hershfield, Allan F. "Education's Technological Revolution: An Event in Search of Leaders." *Change* (November/December 1980):48-52.

"Higher Education Utilization Study." Information packet for press conference. Washington, D.C.: Corporation for Public Broadcasting, November 7, 1979.

Hobbs, Thomas W. "Consortium Uses of Telecourse Materials." *Organizing Telecourse Users*. Washington, D.C.: American Association of Community and Junior Colleges, November 3, 1980.

Kressel, Marilyn, ed. *Adult Learning and Public Broadcasting*. Washington, D.C.: American Association of Community and Junior Colleges, 1980.

McCabe, Robert H. "The Economics of Television Centered Courses." *Using Mass Media for Learning*. Edited by Roger Yarrington. Washington, D.C.: American Association of Community and Junior Colleges, 1979. ED 165 856. MF-$1.06; PC-$8.35.

Mahoney, Sheila; DeMartino, Nick; and Stengel, Robert. *Keeping PACE with the New Television*. New York: Carnegie Corporation of New York, 1980.

Mittelstet, Stephen K. "Telecourse Design, Development, and Evaluation." *Using Mass Media for Learning*. Edited by Roger Yarrington. Washington, D.C.: American Association of Community and Junior Colleges, 1979. ED 165 856. MF-$1.06; PC-$8.35.

Munshi, Kiki Skagen. *Telecourses: Reflections '80*. Prepared for the Station-College Executive Project in Adult Learning. Washington, D.C.: Corporation for Public Broadcasting, 1980. ED 191 115. MF $1.06, HC-$12.00.

Rice, Michael. "From 'The Ascent of Man' to What?" *The Communications Revolution and the Education of Americans*. New Rochelle, N.Y.: Change Magazine Press, 1980.

Smith, Ralph Lee. "A Telecommunicaiton Primer for College Presidents. Part I. The Technology Defined." *Planning for Higher Education* 7 (December 1978a):7-11.

_____. "A Telecommunications Primer for College Presidents. Part II. Implications and Issues." *Planning for Higher Education* 7(December 1978b):16-23.

Zigerell, James J. "A Brief Historical Survey." *Using Mass Media for Learning*. Edited by Roger Yarrington. Washington, D.C.: American Association of Community and Junior Colleges, 1979. ED 165 856. MF-$1.06; PC-$8.35.

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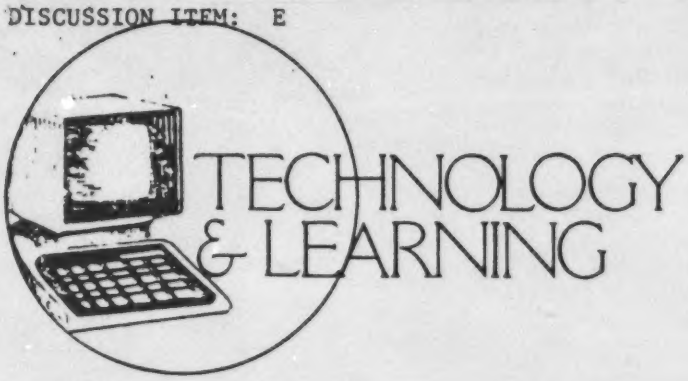
DISCUSSION ITEM: E



Education's Technological Revolution: An Event in Search of Leaders

BY ALLAN F. HERSHFIELD

How many times, over the past fifty years, have members of the academic community and the public at large read or heard forecasts of an impending educational millenium because of a particular technological innovation? Fifty years ago, radio broadcasting was supposed to revolutionize education. Soon thereafter, teaching machine afficionados predicted sweeping changes would be brought about by their particular device. Then, television was touted as the medium that would bring about extraordinary changes in the educational process. Likewise, computers, lasers, videocassette and videodisc machines, and communications satellites have been pushed by one individual or another as innovations that would have a major impact on the educational process.

Although one can, indeed, identify creative uses of instructional television, computers, programmed instruction, and satellites by institutions of higher education, few of these innovations are part of the regular educational processes in most of our institutions of higher education. Television, for example, was used by some 71 percent of all American colleges and universities in 1978-79, but mostly to broadcast courses to off-campus students. Only a few universities and colleges have television as part of a carefully planned package of instructional materials used in their regular academic programs, and those institutions using television in this way tend not to have on-campus students–for example, Coastline Community College in California, the Miami-Dade Community College in Florida, the University of Maryland's University College, the University of Mid-America, and the British Open University and its European counterparts. (See *Change*, October 1980, for discussion of the Open University.) When used for off-campus instruction, television is seen by most university faculty and administration, as well as students, as providing education inferior in quality to that provided by traditional on-campus programs. As long as these perceptions persist, colleges and universities will not realize the fullest educational potential of this powerful medium nor the even greater potential of the full range of instructional technology.

External critics, who lambast colleges and universities for failing to make effective use of instructional technology, almost always point to faculty recalcitrance as the insurmountable barrier. But though most faculty have not adopted new technology, there are many reasons this is so, and faculty conservatism, although an important impediment, is by no means the only one. Faculty members, in general, are locked into systems that block the effective use of instructional technology.

Systemic Barriers

Those outside the university, and, indeed, many people within it, do not understand the central role of the faculty, particularly in the field of instruction and curriculum development. In most instances, individual faculty have (and should continue to have) almost complete freedom to develop and use whatever methods of instruction they deem appropriate–within the broadly defined boundaries of professional responsibility. Thus, the decision to use a particular method of instruction is an individual one reserved to each faculty member, and getting a new method of instruction adopted widely requires thousands of faculty members to make *individual* decisions to use the new method.

ALLAN F. HERSHFIELD is the newly appointed executive director of the National University Consortium for Telecommunications in Teaching, the first national system of television-assisted courses leading to bachelor's degrees. The Consortium began operation this fall on eleven public and cable television stations and seven colleges and universities across the country. Dr. Hershfield is headquartered at the Maryland Center for Public Broadcasting.

Course Development

The course development process in a traditional college or university is basically labor intensive, involving a single faculty member in the development of a particular course. Usually, no major capital investment is required except that originally needed for buildings, laboratories, libraries, and so forth. Apart from an occasional summer grant to support a faculty member while he or she develops a new course, no major costs are associated with such an activity. Most new courses are developed *as they are taught**—while the faculty member is teaching other courses, engaged in research, advising students, participating in committee work, and carrying on whatever public service activities can be fitted into a busy schedule. Faculty are, in effect, being paid a single sum of money to develop and to deliver a course.

Courses or units developed to use new technology effectively, frequently involve recording an entire course or much of the material in advance, in one or more forms such as films, videotapes, computer programs, programmed texts, audiotapes, or slides. This course development process is quite different from the traditional one just described, and it is not consistent with common institutional practices and faculty and administrative values and behavior. One example should suffice.

One might imagine the reception a faculty member wanting to develop a new basic writing skills course would receive from the department chairperson, the dean, or the vice-chancellor if he or she made the following request:

> "I need $150,000 and a full year of released time, a learning theorist, an instructional technologist and two graduate students to develop, test, and produce a basic writing skills course that will be composed of color videocassettes, audiocassettes, computer-based programmed texts and tests, controlled vocabulary reading materials, and a diagnostic entry examination to be administered to all entering students. I will also need $10,000 to support the activities of an advisory committee composed of ten colleagues from my discipline. This committee will be expected to make a major contribution to the development of this course. Outside consultants will also be hired with this money.
>
> When I complete this development process, we will need to spend $50,000 to purchase the equipment needed to deliver this course. Moreover, because students will be spending a great deal of time working with the materials produced for this course, and less time listening to me live, in the classroom, my number of student contact hours will be reduced substantially. But, because my course will be used to teach many more students than I could have taught in the traditional mode, I should have a reduced course load. If these materials are sold or used outside the university, I should receive 'residual payments' similar to those paid to film and television performers. Finally, you'll need to provide $15,000 a year for possible annual revision of a portion of the materials."

Assuming the administrator to whom the faculty member made such a proposal did not have an immediate cardiac arrest, one can be quite sure he or she would give the faculty member a vigorous negative response. Moreover, the faculty member might lose so much credibility in the administrator's eyes, for having made such a proposal, that it could be difficult to get the administrator to give serious consideration to any future proposals from the faculty member—whatever their purpose.

Traditional administrative practices and values make it difficult even to think about funding course development in the high technology mode. Funds are divided into hundreds of small "pots" and allocated to departments. The largest proportion of the budget, 70 percent to 80 percent, is used to pay salaries. Ideas that do not fit this "bits and pieces" resource allocation system are often excluded from consideration.

The full-scale, technologically based course development process is heavily capital intensive—with very large amounts of resources being required to develop a single course or unit. Capital is needed to produce and test the software, to set up and operate a system to deliver the course, and to provide funds to update 10 percent to 20 percent of the software on an annual basis. Few, if any, American states, colleges or universities have any regular mechanism for funding course development activities of this nature on a large scale.* Development of this type, to the extent that it does occur, almost always takes place as an unusual exception to existing practice.

Investment Returns

The only way such heavy capital investments can be justified is for the course or its various components to be used by very large numbers of students—many more than a single faculty member would normally teach during one academic term. Let us pursue this point further by analyzing the situation of a faculty member in a typical American university.

Assume the faculty member normally teaches three different three-credit courses per term, and the average enrollment in each course is thirty students. Using current administrative parlance, the faculty member would have generated 270 student credit hours—90 for each course (3 credit hours X 30 students = 90 student credit hours X 3 courses = 270). If the faculty member's salary were $21,000 per year, for a nine-month contract, and the academic year had two semesters, the direct cost of instruction in the traditional mode is almost $39 per student credit hour ($21,000 ÷ 2 semesters = $10,500 per semester ÷ 270 student credit hours = $38.88).

Looking at the high technology model, the costs mentioned above come to: capital, $210,000 (for software development and equipment), and the recurring annual costs, $15,000 (updating and delivery of software). Note that this does not include the faculty member's salary.

Because the average American faculty member would seldom teach three sections of the same course during one semester, it is reasonable to assume two of the three sections he or she teaches are

*In most American colleges and universities, it is assumed faculty will spend three hours preparing to deliver each hour of instruction. The origin of this "rule of thumb" is not clear. What is clear is that no one knows what it really takes in faculty time and institutional resources to develop an *effective*, new course—either in the traditional mode or using technology.

*The British Open University and its counterpart distance learning institutions in Europe do receive regular funding for software development, but the traditional European institutions do not have this type of support.

of the same course, and this is the one which will be produced using the technological approach.

In two sections of this course, with thirty students each, the faculty member will generate 180 student credit hours. The cost for his or her salary, apportioned by student credit hours, is still almost $39. If the technologically based course were to be used only once to teach two sections of the class, the additional costs per student credit hour generated would be $1,167. The faculty member's salary added to that would bring the overall cost to $1,206 per student credit hour generated. If we assume the course will be used five years without major modifications (the $15,000 budget for recurring costs is for minor modifications) to teach two sections per semester, or four sections per academic year, the faculty member would generate 1,800 student credit hours, and the annual capital cost would be $54,000 derived as follows:

One Time Capital Cost:
$210,000

Four-Year Revision Cost at $15,000 per Year:
$60,000

Total Annual Capital Cost, 5 Years:
$270,000 ÷ 5 yrs. = $54,000

The cost of course development would be almost $150 per student credit hour. Adding the cost of the faculty member's salary, we arrive at a cost of almost $189 per student credit hour generated, if the course developed is used only to teach those students the individual faculty member would have taught anyway. The cost for this form of delivery would be almost five times that of instruction in the traditional mode. No contemporary educational system would bear such costs, even if they resulted in a substantial increase in learning. To justify the expenditure of such a large sum of money, the course would have to generate 7,000 student credit hours to reach a cost per student credit hour generated of $38.57, and this would not be more efficient than the traditional mode, although it should be pedagogically more effective.

Thus, the course would have to be used to teach 2,333 students over a five-year period, rather than the 600 who would normally be taught, to get the cost per student credit hour down to a figure comparable to the direct cost of instruction in the traditional mode. This analysis makes it clear that the full scale use of technology cannot result in the more efficient delivery of educational services unless technology is used to displace faculty members. Faculty members, who might be willing to try to develop new, more effective and efficient approaches to delivering educational services, would stop very quickly once they perceived they were being asked to invent the means by which to put themselves and many of their colleagues out of a job.

Students

Many individuals who push for the wider use of instructional technology seldom take into account student attitudes toward such developments. In an urban-industrial society, increasingly depersonalized by the use of technology in almost every phase of life, university students are not likely to be pleased with an approach to instruction they perceive will afford them less face-to-face contact with their professors. Indeed, there is some anecdotal evidence to suggest that substantial numbers of older adults may enroll in extension courses primarily to be with other people and to have an opportunity to interact with the professor.

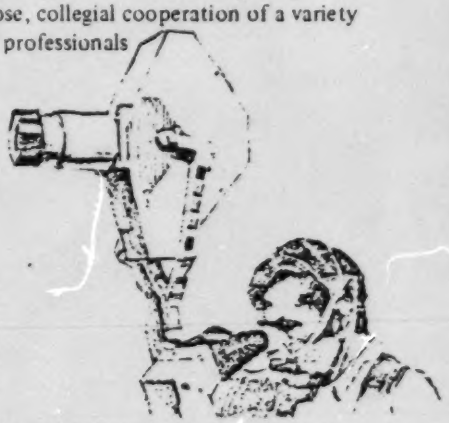
Faculty, too, generally reject what they perceive to be the depersonalization of the educational process that may result from the increased use of instructional technology.

Technological Considerations

It is difficult to find, within most American universities and colleges, trained instructional technologists who can deal with a wide variety of technological and nontechnological approaches to education with equal competence, professionalism, and ease. One tends to find experts in instructional television, computer-based instruction, and audio-visual equipment such as film and overhead projectors. Each of these individuals is a devotee of his or her particular form of technology and recommends it vigorously to resolve *every* pedagogical problem. "Experts" such as these often lose sight of students as the beneficiaries of the educational process. Moreover, faculty, administrators, and students have all too often been frustrated by the failure or inadequacy of both the equipment and the software provided by these "experts," and this too contributes to the reinforcement of negative attitudes towards the use of technology.

Faculty Conservatism and the Research University

There is a single more or less pervasive model of excellence in higher education—the prestigious research university. Faculty members who are successful in such institutions emphasize certain activities and patterns of behavior that are often antithetical to seeking out and using information on new approaches to instruction. These patterns of faculty behavior are not consistent with the requirement that the development of high technology education software is, of necessity, a *team* effort requiring the close, collegial cooperation of a variety of professionals



As graduate students, most doctoral candidates focus their attention on becoming competent in one or more subfields of an academic discipline and on acquiring the skills needed to do research within that subfield. They also learn, from their faculty mentors, that the primary function of university faculty members is to push forward the boundaries of knowledge in their chosen specialty by doing original research—the results of which will contribute to the development of a body of theory and which will be publishable in the most respected scholarly journals in their discipline. A closely related function will be that of communicating the knowledge they acquire to graduate and undergraduate students. Although teaching assistants

(usually graduate students) in some research universities now receive some training to prepare them to teach, little emphasis is placed on this activity as a regular part of graduate education, and most faculty members continue to teach as they were taught—using the lecture method.

The emphasis, then, is on highly individualistic, creative, intellectual work focused on problems defined by an academic discipline. Judgments of the quality and quantity of a faculty member's published work are made largely on the basis of evaluations made by specialists in his or her disciplinary subfields, many of whom are at other institutions of higher education. These judgments and those of his or her departmental colleagues are of primary importance in decisions on promotion and tenure, and to a lesser extent, annual salary increases based on merit. A faculty member's performance will be judged by the extent to which he or she conforms successfully to this behavior pattern.

To expect many faculty members at these universities to take the time away from their research to participate in the type of course development process needed by the new technology is unrealistic, and perhaps, inconsistent with the mission of the research university. Faculty who would become actively involved in this intensive development process would have little time left to conduct original research. Because these major research universities have been and continue to be so successful, it is unlikely to expect significant structural changes in these institutions or modifications in the behavior of their faculty members.

Other Higher Education Institutions

If one cannot expect a technological revolution in higher education to begin at prestigious universities, is it then possible that other, different types of American institutions of higher education will make the changes necessary to move in new directions? With the possible exception of some community colleges, the prospects for this sort of change are not good. Though there are relatively few prestigious research universities, there is a single model of excellence, in the minds of most faculty members and administrators, and many of them exhibit all the patterns of faculty behavior found in the research institutions—without producing the quantity or quality of publications produced by their counterparts at such schools as Harvard, Yale, Stanford, Berkeley, Wisconsin, and Michigan.

The national decline in American and many European university and college enrollments projected over two decades may provide some unusual opportunities to move some American universities and colleges and European postsecondary educational institutions in new directions. Most observers believe the coming reduction in the eighteen- to twenty-four-year-old cohort will have a differential effect on different types of universities and colleges. According to these observers, the American institutions least likely to feel the full impact of this decline will be research universities and community colleges. Given imaginative and knowledgeable leadership on the part of the administration and faculty of institutions facing an enrollment drop, a pending decline may provide an incentive to move in new directions—assuming this movement starts before the decline begins.

The suggestions which follow are intended to help those colleges and universities wishing to use the high technology mode of instruction as part of a new approach to education.

Policies and Practices Intended to Facilitate the Use of Instructional Technology

A number of changes in institutional policies and procedures can activate faculty to become involved in the development and use of instructional technology and at the same time, protect their jobs, and reward them for their efforts.

Obtaining Development Capital

State and national government officials and individuals in the private sector, interested in stimulating the use of instructional technology, must create some regular funding mechanism to provide the capital necessary to develop and deliver instructional software, and they must be willing to re-examine and discard those measures of efficiency which prevent faculty and administrators from developing and using technologically based approaches to instruction.

Teamwork

As many faculty as possible should be involved in the development of the course. Individual faculty members generally have different areas of expertise within the same discipline; and a mediated course or unit in which the content is accurate and current requires that different faculty members handle that part of a course in which they have the greatest expertise. Also, involving as many faculty as possible greatly increases the probability that each of the faculty members will approve the use of the course, and this should increase markedly the number of students who will use the course. Again, involving several faculty members as a group, preferably on a full-time basis for the development of the course, removes the members from a system that reinforces individualistic behavior.

An explicit orientation may help faculty members understand the differences between the normal pattern of faculty behavior and that required to develop packages of mediated materials successfully. The orientation must show that the effective development and use of instructional technology is basically a team effort requiring careful planning by and close cooperation of highly skilled professionals in several fields. First and foremost among these is, of course, the faculty member. The faculty member is the content expert responsible for ensuring that the course goals are current, accurate, and appropriate to the entry level knowledge of the students.

A second skilled member of the team might be a learning theorist who would help the faculty member determine sequence of content and the particular type of learning experiences most likely to help the students attain the goals set for particular units. One might also employ instructional technologists skilled in the design and production of instructional materials for a wide variety of media—computers, television, radio, programmed texts, simulation games, slides, tapes, charts, graphs, overheads, and photographs. The technologists' role is to know the basic characteristics of each medium, to recommend the most effective and efficient combination of media to help particular kinds of students attain course objectives, and to

help the faculty member and the learning theorists produce materials for each medium.

From time to time, various outside consultants may be called upon to participate in the development process, and hence the team effort. It takes a set of skills very different from those usually dominant in highly individualistic and sometimes idiosyncratic faculty members to get a team of professionals to set team goals and to work cooperatively toward the attainment of such goals. Though the faculty member must be treated as the first among equals, someone must be put in charge who has a firm understanding of the entire process, and can activate cooperative effort and resolve disputes in a creative and constructive manner. Whichever member of the team can best carry out this sophisticated leadership function should be put in charge of the project. In any event, the faculty member must have the final word on content.

Use of High Technology

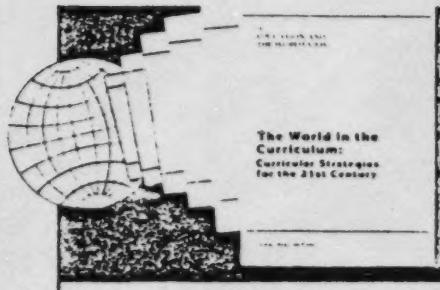
Both students and faculty must come to understand the advantages they can derive from the effective use of instructional technology; what the limits of this technology are; and when it should not be used. The high technology, capital intensive mode of course development described earlier can best be used for those courses and parts of courses in which the content is relatively stable, and the teaching-learning objectives are fairly clear. Basic, introductory courses in almost any discipline other than performance courses in theater arts, music, and art are generally appropriate for this type of developmental work.

The professor's role would be changed, by use of the high technology mode, to that of tutor in a comparatively small group. This will allow face-to-face interaction rather than the presentation of material to hundreds of students assembled in massive lecture sections. The advantages of this type of faculty and graduate assistant role change should be obvious to both students and faculty.

Conclusion

Although much university level instruction is not suited to the development of sophisticated packages of mediated materials, American and European colleges and universities are making little effort to develop and use instructional technology effectively in those areas that show great promise. The barriers described earlier are not insurmountable. They can and will be overcome, given initiative, imagination and commitment on the part of the faculty, administration, students and those governmental institutions that provide funding for higher education.

The technology to improve both educational effectiveness and efficiency is now available. If institutions of higher education do not move quickly to take advantage of this technology, private industry and new types of non-profit educational organizations will do so.



Announcing a series of important publications from the Council on Learning's Education and the World View Project

From 1978 through early 1981, the Council on Learning has engaged in an extensive study on the growing need of undergraduate education to reflect the nation's changed global circumstances. This project was assisted by an advisory task force of prominent Americans, and is supported by the National Endowment for the Humanities, the U.S. Department of Education, and the Exxon Education Foundation.

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Research & Creative Activity at Indiana University, Bloomington

Volume II Number 2 January 1979

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A Teacher Named PLATO: Computer-Assisted Instruction

"When you first sit at a computer terminal, the feeling is one of sheer terror. Sweat and chills, jumpiness and sudden clumsy nervous motions, lunatic absent mindedness and stammering fear and awkardness interfere with your ability to function. It's perfectly normal."

-PLATO

Thus, the wary, first time PLATO user is heartened and emboldened by the computer's compassionate affability. PLATO (an inventor's pet name which later became an acronym for "Programmed Logic and Automatic Teaching Operations") is inanimate only in the biological sense; it is otherwise responsive and highly "animated" in its exchanges with students across the United States, in Canada as well as in Europe. For PLATO, an electronic education and communication network, is more than a dispensor of information. The creativity and imagination of its developers at the University of Illinois in Urbana, and of its hundreds of successive programmers have provided the system with a distinct personality, one which, in the words of a devotee here, is "pleasant, relaxed, friendly and generally agreeable on a number of other accounts."

While some scientists believe that computers will one day have minds of their own, most scoff at the idea that even the most elaborate circuitry could master the incredible complexity of a single original thought. Yet few would deny that a computer can be made to seem almost human by its programmers. PLATO humorously relinquishes responsibility for its "mortal" behavior as it admonishes students, "If the computer doesn't accept your answer don't jump up and down and curse at PLATO...jump up and down and curse at the person who wrote the lesson."

Those people who "write the lessons" at I.U., including Education professor Al Strickland, Music professor Gary Wittlich, and Journalism PLATO coordinator William Oates, are among a growing body of academicians, industrialists and other professionals who together have programmed thousands of hours of PLATO exercises on over 140 subject areas – ranging from piloting a Boeing 747 to spelling "capital." The enormous potential of computer assisted instruction (CAI) is rapidly gaining recognition in the United States and abroad. National and international conferences on CAI; new groups such as the Association for the Development of Computer-based Instruction Systems (ADCIS) and PLATO users' own group (PUG); as well as recently initiated journals devoted to trends in computer education, attest to the growing success of this major new educational phenomenon.

As an early pioneer in CAI, PLATO is now one of the most extensive systems of its kind in the world; over a million terminal hours of instruction and center-to-center communications accumulate annually. The beneficiaries of PLATO'S tutelage to date include students of all ages and abilities, prison inmates, and developmentally disabled children and adults. Individual universities have developed and sponsored most of the computer's instructional programs. The Minnesota-based Control Data Corporation, which is licensed to sell PLATO services and manufacture terminals, also offers an instructional curriculum called the "Basic Skills Learning System" designed to help underachievers advance from a third-grade to an eighth-grade equivalency in reading, language and math. Airlines, pharmaceutical companies and banks have begun to use the computer as well in training their respective personnel.

Much of the excitement over PLATO stems from the system's remarkable simulation capabilities. In a lesson designed at the University of Illinois, "plants" actually grow or wither depending upon the chemical treatment selected by the viewer. Pilot trainees have been reported to develop sweaty palms and stiff necks before PLATO's simulated 747 instrument panel, which depicts all too realis-

tically the effects of erratic weather and human error. (For this and other lessons, touch sensitive PLATO screens are used; thus, the pilot trainees elicit a response from PLATO by "pushing buttons" on the screen.)

PLATO first became operational in 1965 after 17 years of research and field testing by the University of Illinois' Computer-based Education Research Laboratory (CERL). The latest PLATO core computers are now located at six additional centers—Arden Hills, Minnesota (two centers); Quebec City, Canada; Brussels, Belgium; Newark, Delaware; and Tallahassee, Florida. The heart of PLATO is actually a two-computer system (a CDC Cyber 73-24 and a CDC 6500) which communicates with individual terminals via PLATO's own television channel or a "microwave link" to "site controller" components. Each site controller connects by telephone line to 32 terminals. Terminals communicate back with the core computer by telephone.

Indiana University tapped into the Illinois PLATO center five years ago with two terminals. Now, of the 1100 terminals locked into that center (from as far away as Hawaii and Sweden), 12 are located here and are used as adjuncts to traditional instruction in a number of departments.[1]

Education professor Al Strickland, who uses his own PLATO lessons to teach metrics and to simulate classroom situations in his Elementary Science Methods course, emphasizes that the system is capable of handling far more than the rote drill component of learning. PLATO is also able to individualize instruction, by evaluating and responding to a particular student's pre-knowledge and learning pace. With PLATO's system of "branched learning", a student who is having difficulty with a lesson, or who shows deficiencies in command of a subject in a computer pre-test may, for example, be routed to review or remedial exercises, while others progress through an increasingly difficult exercise. Thus, the system is simultaneously a "text, test and tutor."

PLATO lessons on a variety of subjects are highly inventive and challenging. Because the computer's language "TUTOR" demands a minimal amount of programming expertise, PLATO authorship, which now numbers in the thousands, is not limited to computer pros—instructional inspiration is rarely damped for want of technical know-how.

At I.U., PLATO has been most visible as a recruit in an interdepartmental effort to improve students' writing skills. Last spring about 150 freshmen in English, Journalism and Comparative Literature spent 832 hours with the popular electronic tutor. According to Oates (who has programmed PLATO lessons on newspaper headline writing, picture editing, typography, and spelling), comparisons between the PLATO and non-PLATO sections of an introductory Journalism course revealed that students who used PLATO benefited measurably from the experience. At the beginning of the semester the non-PLATO section's mean score on a standardized grammar test was 12 percent higher than that of the PLATO section; on the same test administered at the semester's end, the mean score for the PLATO section was significantly higher than both the starting score of that section as well as the final mean score of the non-PLATO section (Table 1).

The PLATO-administered pre-tests and post-tests, used to route individual students along appropriate lesson sequences, and to evaluate progress,[2] offer corroborative evidence of PLATO's posi-

Albert Strickland and PLATO.

[1] Other terminals in the state are located in Evansville, Indianapolis, IU Purdue at Fort Wayne, and Valparaiso.

[2] Such tests comprise one aspect of PLATO's elaborate "Language Arts Routing System" (LARS) within its grammar curriculum.

William Oates, with an exercise from a journalism program he wrote on the screen.

tive impact. By the end of the semester the mean grammar scores of the PLATO sections in an English and in a Journalism writing class had each risen by 26 percentage points (Table 2).

When 35 students were asked about the factors behind their progress, most of the credit (i.e., for 51 percent of the overall improvement) went to classroom activities. Independent study with the computer was also deemed a strong influence—students attributed 30 percent of their total improvement to PLATO's help. PLATO, moreover, was the mode of learning grammar they most preferred. Various studies have, in fact, indicated that over 90 percent of all students who use PLATO enjoy it. On the average I.U. students have given PLATO high marks for being worthwhile, pleasant, relaxed and communicative; they also consider the computer more humane than dehumanizing, a judgement sanctioned by anyone familiar with the heartening "there ya go" with which PLATO is sometimes known to reward a correct answer.

Students who are shy in the classroom appreciate the computer for yet another quality—its privacy. Some, afraid or simply unable to speak up before their peers, "open up" to PLATO. The notes they type may be their major line of communication with the teacher who retrieves them.

PLATO's own attributes are impressive enough. The system can also be combined with other graphics and with phonics to create what Strickland calls a rich multi-media package for learning. With a hook-up to a random access slide projector the PLATO screen can, for example, display a newsprint photo for a picture cropping exercise or a gridded pond in an ecology lesson. Indiana University is one of three universities where PLATO has also been interfaced with a video-cassette recorder. The computer-controlled cassette, which can be programmed to ask students questions relating to the video presentation, provides a highly efficient mode of instruction. A more recent accessory, the "music box," responds to the notes typed onto the screen with PLATO's own brand of computer music, a talent which the I.U. Music School has tapped.

Music professor Gary Wittlich, who helped found the National Consortium for Computer-based Music Instruction, believes that of the CAI systems now being used for music instruction, PLATO offers the best developed and most interesting lessons. Actual composition on PLATO is an intriguing possibility, but is rather cumbersome at present—the music box used in conjunction with two terminals here can produce only four sounds (akin to those of a woodwind) simultaneously. More advanced 16 channel synthesizers have recently become available, though their cost is presently somewhat prohibitive. The present four channel synthesizer is well suited for instructional purposes, however. Students taking courses on the rudiments of music before proceeding on to the I.U. School's core curriculum study intervals and triads on PLATO and learn to associate sounds

with the appropriate symbols. These lessons, written largely at the University of Delaware, are also available for incoming graduate students who wish to review the fundamentals.

PLATO is familiar to more advanced music students as well. Wittlich, for example, has written lessons introducing students to the new analytic methods of 20th century music. While the traditional music of the 18th and 19th centuries is constructed around a tonal center (a note in a particular key), much more recently composed music utilizes other organizational principles. Wittlich's PLATO lessons provide condensed discussions of the terminology and symbols required to approach this kind of music analytically. In other lessons, graduate students learn the TUTOR language and use it to program projects in CAI.

PLATO, in fact, offers educators a unique research opportunity; the computer efficiently and untiringly collects and stores data on the learning and instructional processes. Both Wittlich and Strickland point out that the insights gleaned from student-PLATO interactions may help human educators evolve more effective teaching methods. Currently, Strickland, who has a substantial background in learning theory and curriculum design as well as computer systems, is one of the few scholars in the country employing PLATO both to assess the most effective uses of CAI and to explore which of several prominent learning models work best for various types of learners.

"We have recognized that individuals are different but have not," he explains, "examined these differences to ascertain if varying the instructional model can alter performance." That question and the answers obtained with PLATO have applications independent of CAI. Strickland believes that there is much truth today in Percival Symonds 1964 observation that, "...in too many places education is still coasting along on traditional rule-of-thumb methods," and emphasizes that educators, especially at elementary levels, could benefit tremendously from an infusion of fundamental learning research.

In one experiment Strickland used a metric lesson he programmed on PLATO both to analyze optimum student groupings for CAI and to begin exploring the interactions between student performance and various learning models. He found that many students who worked in groups of three at a PLATO terminal performed better and learned faster than students working alone. In a different but parallel PLATO performance study James Okey of the University of Georgia found that groups of three students per-

TABLE 1

Grammar test mean scores in J111 sections

	PLATO Section	Non-Plato Section	Significance*
Start of semester	42%	54%	.01
End of semester	62%	52%	.06
Significance*	.00	NS	

*The significance numbers correspond to the probablility of the observed differences being due to chance. NS, "not significant," means the variation is likely to be due to chance.

TABLE 2

Mean Scores on PLATO/LARS Tests

	J111 Class	W131 Class	Significance
Pretests	59%	55%	NS
Posttests	85%	81%	NS
Significance	.00	.00	

Gary Wittlich watches as music education student Dan Henry works on a PLATO keyboard lesson.

formed as well as one student using a terminal. These results not only have significant economic implications (fewer terminals may be needed for a given group of students in some contexts); they also suggest how learning with CAI may be improved. Additionally, Strickland observed a strong relationship between learner aptitudes and the effectiveness of various learning models. This encouraged him to continue exploring the interactions between individual students and these "information processing" modes.

Strickland has worked primarily with three learning models: one describes the basically inductive process of ordering related information into concepts; another exemplifies a method of deductive learning; and a third structures learning around lessons which are described to the student before they are actually presented. After designing and programming on PLATO three basic lessons on the weather (one following each model), he used the highly reliable Myers-Briggs personality type indicator test to categorize student subjects. Students were then randomly assigned to a lesson on "weather". Although the experiment is still in progress, Strickland has already made some preliminary observations: highly anxious people, for example, do not seem to learn well by inductive methods—they may require more external structure (as supplied by a deductive model) to attain their highest level of achievement. Impulsive students, who make quick decisions and many errors, also don't do as well as more reflective people using the same (inductive) format.

Once a range of such observations are available, students with special attributes will be assigned to the learning model which would seem to offer them the highest chance of success. The conclusions drawn from the preliminary stages of the experiment can then be tested directly.

Strickland's premise, that one method of instruction is not "the most effective method for training large numbers of students possessing dissimilar patterns of abilities," has already been borne out by his data. Although teachers with large elementary classes cannot be expected to individualize each lesson for each student, Strickland believes that they can and should employ multiple rather than single learning strategies. In his own Elementary Science Methods course he is attempting to show students how best to meet the mosaic needs of a group. PLATO simulations of classroom situations, where imaginary pupils are given specific attributes, comprise an important part of the course.

Like his PLATO colleagues at I.U. Strickland believes that fuller use of CAI is one possible answer to the educator's dilemma. As he has pointed out, PLATO generates the most interest not as a technical advance per se, but as "the medium by which individualized instruction might become a reality." Although few institutions of higher learning have, like I.U. incorporated CAI into a fixed curriculum, Strickland maintains that many of the things we must learn as individuals in our society can be successfully mastered through alternate forms of instruction. He stresses that CAI is not a replacement for teachers. On the contrary, he believes technology should free teachers "to do the best and most efficient things" they can do—the goal after all is not simply "to teach" but "to facilitate learning."

PLATO's future is an oft-discussed topic at I.U. Ideally, according to Strickland, Oates and Wittlich, I.U. might acquire its own PLATO core computer. The Bloomington campus is now limited contractually by the University of Illinois to a specific number of terminals; if a new center were established for the I.U. system, PLATO could be a much more visible and active force here. At the Urbana campus, for example, almost 200 terminals are available to students in Physics, Chemistry, Foreign Languages, Veterinary Medicine, Music, and Law. Nearly 70 are in one room built specifically for PLATO in the Foreign Languages Building. While the initial cost of a core computer would be large, PLATO's advocates here feel that its ultimate value—for instruction and system-wide communication—would also be considerable.

Meanwhile, the computer terminals in Bloomington will continue to play a role in grammar and writing instruction through the English Department's university-wide "writing clinic." Strickland is currently developing a PLATO program on lesson planning for elementary education majors; Wittlich and his Music School colleagues hope eventually to structure a comprehensive set of PLATO lessons for use throughout the school's core curriculum. These faculty and other members of the university's PLATO board (James Ackerman, William Burgan, N. John Castellan, Joseph Gajewski, Michael Groomer, Ken Koester, Frank Lester, Bill Sanders, Thomas Schwen, and Alan Winold) are eager not only to establish a firm PLATO base at IU; they also hope to exchange ideas and coordinate their efforts with educators active in CAI elsewhere. Last summer a weekend PLATO conference organized by Oates included participants from I.U. as well as a number of universities, including the University of Colorado in Boulder, the University of Illinois, Sangamon State University in Springfield, Illinois, the University of Delaware, Malcolm X College in Chicago, Kennedy-King College in Chicago, and IUPUI. Representatives also came from the Washington (D.C.) Learning Center of the Control Data Corporation. Those who gathered in Ernie Pyle Hall to compare notes and discuss PLATO's prospects unanimously called for a greater sharing in lesson development and other PLATO activities.

The feeling is one of optimism: some of the most active intellects in the country are exploring the potential of CAI—and their numbers are growing. PLATO, it seems, is part of a movement which promises, if not to revolutionize, at least to measurably transform the educational process.

DISCUSSION ITEM: G

COMMUNITY ACCESS CHANNEL THREE
Monroe County Public Library
303 East Kirkwood Avenue
Bloomington, IN 47401
(812) 339-2271, ext. 20
Contact Person: Dr. Don R. Smith

The Monroe County Public Library has operated a community access channel in Bloomington, Indiana, since 1974. Channel Three programs 68 hours per week and produces 20-25 new programs each month. Program sources include:

Live coverage of all City Council meetings
Coverage of public forums held in the library auditorium
Local arts performances
Documentaries on local heritage and community issues
"Kids Alive!" our program for children, by children, and often in spite of children
Videotape exchanges with other community groups

Channel Three is funded by the Monroe County Public Library, the City of Bloomington Telecommunications Council, and Horizon Communications Corporation.

Channel Three has a staff of one full time, three part time, six workstudy and many interns.

Facilities include single camera, both color and black and white portable, three camera (color) portable, editing, and a time base corrector.

Available formats include:

1/2" reel to reel
VHS
Beta 1
3/4" U-matic

Services include:

Training in portable and studio production and editing.
Equipment access
Community programming
Videotape sale, rental and exchange
Consultation in community utilization of cable television

No fees are charged for training or use of equipment. Equipment can only be used to make programs for Channel Three Community Access Collection.

CHANNEL THREE FACT SHEET

* Channel Three cablecasts over 4,000 programs per year, over 3,300 hours to 9,000 homes in Bloomington and Monroe County, a potential audience of 27,000 people.

* Each year Channel Three produces over 250 local programs including live coverage of all City Council meetings.

* 67% or 2,820 programs per year are shown on viewer request. Viewers can call 7 days a week to place requests.

* 49% of requested programs (1,380) are produced locally in cooperation with 125 community organizations and involve over 1,500 participants.

* In the two week period July 14-28, 1980, Channel Three had 112 requests for programs and was scheduling programs 3 to 4 days in advance.

* 50% of the cable subscribers (4,500) in the Bloomington area watch programs on Channel Three.

* 35% watch City Council meetings.

* 15% of the cable subscribers surveyed use our request service. Children, our heaviest users, were not included in the survey.

* 38% or 3,420 subscribers gave "to get local programming" as a reason for subscribing to cable television.

COMMUNITY COMMUNICATIONS SERVICES

* 250 new programs each year - public forums, local heritage, arts events

* Micro-computer community calendar - features <u>This Week at the Library</u> and local announcements.

* UPI News Service provided by Horizon Communications Corp.

* "Kids Alive!" by kids, for kids, with kids, and in spite of kids.

* Live coverage of all City Council meetings.

* Live Election Coverage

* Video productions workshops.

* Videotape exchanges with other communities.

SPECIAL PROJECTS

Gene Stratton-Porter: Voice of the Limberlost, a videotape documentary funded by the Indiana Committee for the Humanities.

Community Utilization of Cable Television: a study funded by the Indiana Higher Education Commission.

Video component "Family Histories: Approaches to the Past" a project funded by the National Endowment for the Humanities.